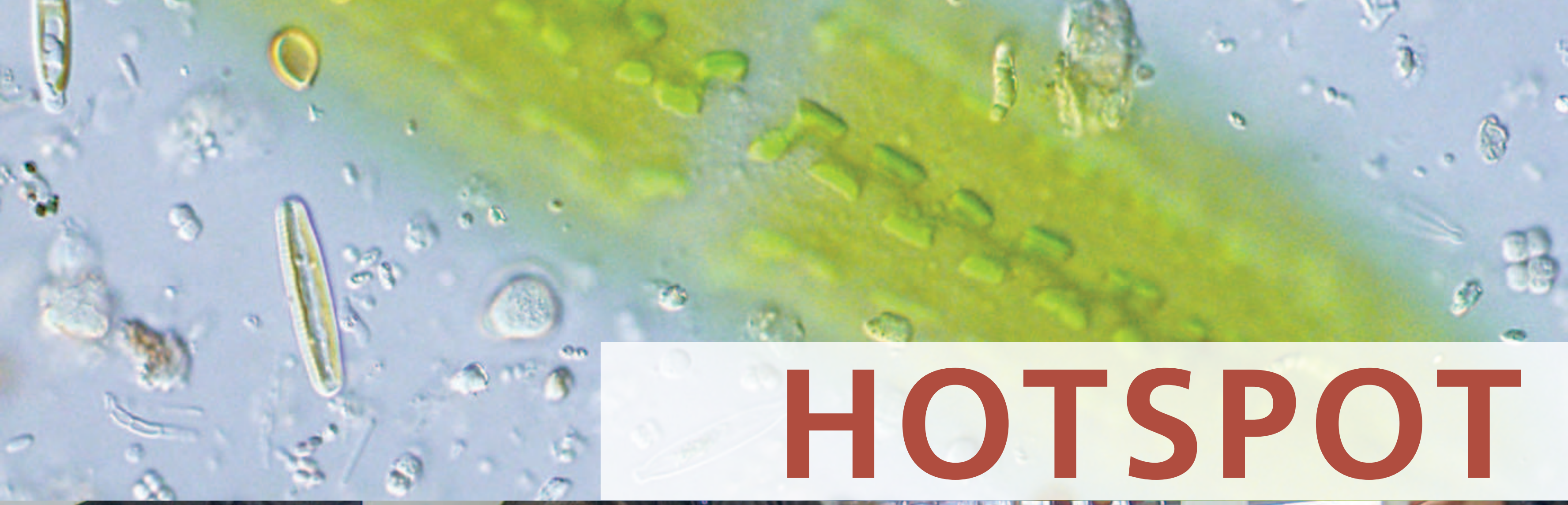
Year: 2013

Making changes visible

Bergamini, A ; Ginzler, C ; Schmidt, B R ; Küchler, M ; Holderegger, R

Abstract: Habitats of national importance are an important tool for biodiversity conservation in Switzerland. A long-term monitoring project will identify changes in habitats of national importance. Aerial photograph interpretation and field surveys provide the necessary data.

Originally published at:
Bergamini, A; Ginzler, C; Schmidt, B R; Küchler, M; Holderegger, R (2013). Making changes visible. Hotspot, 28:18-19.



HOTSPOT

Measuring biodiversity

Research and practice in dialogue
Bulletin of the Swiss Biodiversity Forum
28 | 2013

Authors

Dr. Matthias Albrecht is an ecologist and researcher with the Agricultural Landscapes and Biodiversity Group at the Agroscope Reckenholz-Tänikon Research Station. He participates in the QUESSA project under the 7th Framework Programme of the EU. He focuses on biodiversity and ecosystem services in agro-ecosystems and approaches to support these.

Dr Ariel Bergamini is a botanist and heads the Ecosystem Dynamics research group at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL as well as the programme "Monitoring the Effectiveness of Habitat Conservation in Switzerland". Further interests include conservation biology with respect to flowering plants and mosses.

Simon Birrer heads the Förderung der Vogelwelt (Support for birdlife) department at the Swiss Ornithological Institute and focuses on applied projects in farming and forestry.

Dr Stefan Eggenberg studied plant taxonomy and vegetation ecology and trained as a scientific draftsman. Formerly co-owner of the Atelier für Naturschutz und Umweltfragen (UNA) in Bern, he is currently Director of Info Flora, the national documentation and information centre for Swiss flora.

Dr Lisa Garnier holds a PhD in ecology. As science journalist, writer and project coordinator, she specialises on conveying biodiversity issues to the wider public. She maintains the Vigie-Nature blog of the French National Natural History Museum in Paris and develops interactive scientific experiments.

Christian Ginzler is a biologist with the Swiss Federal Institute for Forest, Snow and Landscape Research WSL. He heads the Remote Sensing research group and primarily works on aerial photograph interpretation, photogrammetry and image analysis as tools to measure landscape change.

Dr Yves Gonseth heads the Swiss Biological Records Center (CSCF) where he is in charge of maintaining contacts with field researchers (primarily entomologists) and cantonal and federal authorities in the areas of species and habitat protection and with relevant international institutions.

Anne-Laure Gourmand works at the French National Natural History Museum in Paris, developing science programmes for Vigie-Nature and implementing them with local stakeholders. She coordinates STELI, a programme to monitor dragonfly populations in France.

Dr Gabriela Hofer is a biologist in the Agricultural Landscapes and Biodiversity Group at Agroscope Reckenholz-Tänikon Research Station. She develops approaches to illustrate species and habitat dynamics in open cultural landscapes and identify the contributions of ecological compensation areas to maintaining species diversity.

Prof. Dr Rolf Holderegger teaches at the Swiss Federal Institute of Technology and heads the Biodiversity and Conservation Biology research unit at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL. He is responsible for overall administration of the programme "Monitoring the Effectiveness of Habitat Conservation in Switzerland".

Dr Markus Jenny is a biologist at the Swiss Ornithological Institute where he is in charge of agricultural projects at the interface of research, implementation, markets and policy. He presides over the Vision Landwirtschaft association, a think-tank of independent experts on farming matters.

Dr Marc Kéry is a population ecologist at the Swiss Ornithological Institute. His research interests include large-scale modelling of species distribution and abundance, population models, and modelling measurement error processes in ecological field studies.

Dr Meinrad Küchler works in the Ecosystem Dynamics research group at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL. He focuses on statistical data analysis and modelling ecological change in different habitat types in Switzerland.

Dr Enrique Lara is a researcher at the University of Neuchâtel where he studies micro-eukaryotes (algae, fungi and a variety of unicellular organisms). He is particularly interested in their evolutionary history, ecology, geographic distribution and their enormous diversity.

Dr Lukas Mathys is a biologist acting as project manager at the Sigmaplan AG consultancy. In a variety of projects, he deals with both substantive and technical aspects of the collection, evaluation and communication of biodiversity data.

Prof. Edward Mitchell has been in charge of the Soil Biology Laboratory of the University of Neuchâtel since 2009 and has co-managed the Neuchâtel Botanic Garden since 2011. His interests include the ecology and biodiversity of soil organisms with a focus on protozoa.

Dr Marco Moretti is an ecologist and team leader at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL in Bellinzona. For the past ten years he has studied aspects of biodiversity and biocoenoses and their relationships to ecosystem processes and services along a range of environmental gradients as well as under laboratory conditions.

Prof. Jan Pawlowski heads the Laboratory for Molecular Evolution and Ecology of Protists of the Department of Genetics and Evolution at Geneva University. His research explores the evolutionary history of eukaryotes. He also manages the Swiss Barcode of Life (SwissBOL) network.

Dr Lukas Pfiffner is an agro-ecologist managing biodiversity and conservation projects at the Research Institute of Organic Agriculture FiBL with a focus on ecological systems optimisation and tri-trophic interactions of arthropods and soil organisms in a variety of cropping systems.

Dr Benedikt Schmidt works at karch – the coordination centre for amphibian and reptile conservation in Switzerland – and leads a research group at Zurich University. By combining research and practical work he contributes to evidence-based conservation.

Dr Eva Spehn is on the scientific staff of the Swiss Biodiversity Forum and manager of the international Global Mountain Biodiversity Assessment network which maintains an online portal for biodiversity data for the world's mountain regions (www.mountainbiodiversity.ch). She is a member of the GBIF Swiss Commission and DIVERSITAS delegate to GBIF.

Dr Sibylle Stöckli is a project manager at the Research Institute of Organic Agriculture FiBL in the areas of biodiversity, climate change and ecosystem functions with a focus on entomology and crop protection.

Silvia Stofer heads the Biodiversity Assessment research group within the Biodiversity and Conservation Biology unit at the Swiss Federal Institute for Forest, Snow and Landscape Research WSL. Her responsibilities include maintaining the national data base of lichens in Switzerland (SwissLichens).

IMPRINT The Swiss Biodiversity Forum promotes the exchange of knowledge between biodiversity research, administrations, practitioners, policy-makers and wider society. HOTSPOT is one of the tools facilitating this exchange. HOTSPOT is published twice a year in German, English and French. It is available for download at www.biodiversity.ch. HOTSPOT 29|2014 will be published in May 2014 and will address the topic of Energy and Biodiversity. **Publisher:** © Forum Biodiversität Schweiz, Bern, November 2013. **Editors:** Dr Gregor Klaus (gk), Dr Daniela Pauli (dp). **Translation into English:** Christopher Hay. **Graphic design:** Esther Schreier, Basel. **Photos:** Photo credits are listed with the captions. **Printing:** Print Media Works, Schopfheim im Wiesental. **Paper:** Circle matt 115 g/m2, 100% recycled. **Print edition:** 3,300 copies in German, 1,100 copies in French, 1,000 copies in English. **Contact:** Forum Biodiversität Schweiz, Schwarztorstr. 9, CH–3007 Bern, Switzerland, Tel. +41 (0)31 312 02 75, biodiversity@scnat.ch, www.-biodiversity.ch. **Managing Director:** Dr Daniela Pauli. **Cost of production:** 15 CHF/copy.

Sharing biodiversity knowledge with all those who are interested in these matters is important to us. We would therefore like to continue to offer HOTSPOT free of charge. Any financial support will be greatly appreciated. HOTSPOT donations account: PC 30-204040-6. Manuscripts are subject to editorial revision. Authors' contributions do not necessarily reflect the opinions of the Swiss Biodiversity Forum.

sc | nat

Science and Policy
Platform of the Swiss Academy of Sciences
Swiss Biodiversity Forum

Cover (top to bottom):
1. Diverse micro-organisms (photo credit: Edward A. D. Mitchell); 2. Determining the diversity of fruit varieties (photo credit: ProSpecieRara Basel); 3. Archived butterfly diversity (photo credit: Beat Ernst Basel); 4. Biologists working in the field (photo credit: Edi Stöckli)

Monitoring the effectiveness of habitat conservation
Making changes visible

Ariel Bergamini[1], Christian Ginzler[1], Benedikt R. Schmidt[2], Meinrad Küchler[1], Rolf Holderegger[1]; [1]Swiss Federal Institute for Forest, Snow and Landscape Research WSL, CH-8903 Birmensdorf; ariel.bergamini@wsl.ch; [2]Koordinationsstelle für Amphibien- und Reptilienschutz in der Schweiz (karch), CH-2000 Neuchâtel

Habitats of national importance are an important tool for biodiversity conservation in Switzerland. A long-term monitoring project will identify changes in habitats of national importance. Aerial photograph interpretation and field surveys provide the necessary data.

The habitats of national importance are pivotal to the Swiss protected area network. They include raised bogs, transition mires, fens, dry grasslands managed as meadows and/or pastures, alluvial areas, and amphibian spawning grounds (Fig. 1). While such habitats only cover two per cent of the country's territory they are vital to the conservation of many rare and endangered habitats and species (Lachat et al. 2010).

However, legal protection does not necessarily ensure the maintenance of ecological quality or conservation value.

A programme monitoring the effectiveness of peatland conservation conducted between 1995 and 2007 showed that the quality of peatland habitats continues to decline despite the protection measures taken. Peatlands became drier and more nutrient-rich and scrub encroachment increased (Klaus 2007; Bergamini et al. 2009). However, there have also been positive developments in peatlands. Drainage ditches were closed off in many raised bogs in order to re-wet the peat body (Staubli 2004). Major investments are also being made in the restoration of other habitats of national importance, notably alluvial floodplains (Göggel 2012).

The FOEN project "Monitoring the Effectiveness of Habitat Conservation in Switzerland" straddles the divergent forces of insidious habitat quality loss on the one hand and positive developments on the other. The primary aim is to ascertain whether the habitats of national importance are developing in keeping with set conservation objectives and whether they are being maintained in both size and quality. The project also provides an early warning system, detecting adverse developments as early as possible and allowing the authorities to be informed and respond in time. As demands upon a monitoring system can change, for example due to new societal or environmental policy conditions, the system must be highly flexible in its options for data analysis. The data should also be compatible for use across habitats and projects. This is achieved through methodological harmonisation between different habitat types within the project as well as between the project and Biodiversity Monitoring Switzerland BDM and the ALL-EMA system of agri-environmental indicators (see p. 17 and Figure p. 21). The project's pilot phase started in the spring of 2011 and will continue to the end of 2014. From 2015 the project will move into routine operation.

The monitoring project has a modular organisation. The three modules at present are "Remote sensing", "Vegetation" and "Amphibians". A fourth module is currently being tested with a view to including further faunal groups such as butterflies or dragonflies and damselflies. A data collection cycle will be completed once every six years for all modules.

Powerful aerial photographs

In the "Remote sensing" module all 6,000 objects in the four habitat inventories are assessed by aerial photograph interpretation using digital aerial imagery produced for the entire country by Swisstopo at six-year intervals. To interpret objects, a grid of 50×50 m cells is placed over each object and intersected with the object perimeter. For each grid square, aerial photography interpreters assess indicators such as the percentage of tree cover, open ground, or the presence of buildings or roads. Using such indicators, comparisons between two photographs taken at different times can reveal processes of change such as scrub encroachment or erosion as well as the reasons for such changes, e.g. the abandonment of farmland.

Aerial photograph interpretation started in summer 2012. The first phase, to conclude in 2017, examines changes since the inventories of habitats of national importance were first compiled. This will soon allow statements about the changes that have occurred. From thereon, aerial imagery of the objects will be compared at six-year intervals. As the "Remote sensing" module covers the entire country, it reveals trends at national and regional levels as well for individual objects. It is therefore possible to detect adverse changes in individual objects at an early stage. This early warning function allows cantons to prioritise responses and swiftly take action to protect such objects.

Extensive field surveys

Vegetation surveys in the field are undertaken in dry grasslands managed as meadows and pastures, peatlands, and alluvial

Fig. 1: Habitats of national importance: Dry meadow in Valais, alpine alluvial floodplain in the Bernese Oberland, raised bog with Swiss mountain pine in Central Switzerland, amphibian breeding site in the Reusstal region. Photo credits: Ariel Bergamini

floodplains. From each of the relevant inventories a weighted random sample was taken to obtain a representative sample of all biogeographic regions, vegetation types, different sizes of objects and different altitudes (Tillé & Ecker, in print). Of the dry grasslands managed as meadows and/or pastures, 400 objects were selected in addition to 250 peatland sites and 120 alluvial floodplains. In each of these objects, between 5 and 40 sampling plots are selected at random and all species present in these plots are recorded (including bryophytes in peatlands) and their cover values estimated. The number of sampling plots for each object depends on the object's size as well as the diversity and rarity of vegetation types occurring therein. Each sampling plot is 10 m² in size (i.e. a circle with a 1.78 m radius). Additionally, in alluvial floodplains shrubs and trees are recorded in a 200 m² circular plot (7.98 m radius). In the field the centre of the sampling plot is located using GPS and then marked as a permanent plot using a magnetic probe. A total of 6,100 vegetation plots are being assessed across the three inventories. In addition, in the dry grasslands a certain proportion of plots, which had already been surveyed when the inventory was established (Eggenberg et al. 2001) are re-assessed. Similarly, some of the plots surveyed by the programme monitoring the effectiveness of peatland conservation are similarly being re-assessed.

The data obtained from the plots allow a wide range of analyses. For example, an analysis of ecological indicator values or of changes in ecological groups (e.g. thermophilic species or neophytes) can point to changes in the habitats in question. In this respect, the focus is on capturing national and regional trends.

The field work for monitoring the effectiveness of protecting amphibian breeding sites builds on surveys conducted for the Red List of Amphibians (Schmidt & Zumbach 2005; see p. 16). A total of 238 amphibian breeding sites of national importance are included in the monitoring project (198 stationary sites and 40 migration sites, i.e. gravel extraction sites) of which 124 had already been surveyed for the Red List. In selecting the sites to be surveyed, attention was paid to ensuring that not only species-rich lowland sites or those containing highly endangered species were included in the set but also sites at higher altitudes. While the latter rarely contain notable species at present, this may well change in the long-term due to climate change.

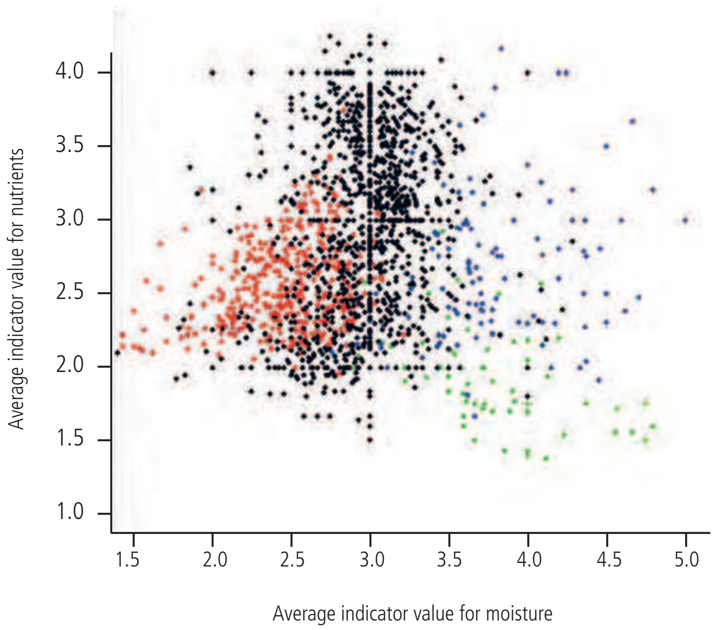


Fig. 2: Mean indicator value for nutrients against mean indicator value for moisture for Z9-plots assessed in the 2nd BDM survey (2006-2010, black dots) and plots of the project monitoring the effectiveness of habitat conservation from the years 2011 and 2012 assessed in dry meadows and pastures (red dots), fens (blue) and raised bogs (green). The plots of the new monitoring project clearly supplement the BDM in the dry, nutrient-poor and wet sectors.

Results-based monitoring and BDM go hand-in-hand

Biodiversity monitoring in Switzerland is a key component and one of the explicit strategic aims of the Swiss Biodiversity Strategy (BAFU 2012). With the BDM programme, an important tool for monitoring changes in biodiversity in Switzerland is already in place (Koordinationsstelle Biodiversitäts-Monitoring Schweiz 2009). However, habitats of national importance are covered by the BDM only by chance, as the proportion of the territory covered by these habitats is so small that they tend to slip through the BDM grid. The project monitoring the effectiveness of habitat conservation therefore supplements the BDM surveys (Fig. 2). These programmes are designed as long-term schemes. Thanks to retrospective aerial photograph interpretation and the inclusion of existing data, initial results can be expected within a few years. The moment of truth however will come as the monitoring programme progresses, i.e. when at least two full surveys are at hand. This will be in about 2023.

Further information

www.wsl.ch/biotopschutz/index_EN

References

biodiversity.ch/index.en.php > Publications